

NON-PUBLIC?: N
ACCESSION #: 9306210397
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Indian Point Unit 3 PAGE: 1 OF 5

DOCKET NUMBER: 05000286

TITLE: Reactor Trip Caused By Independent Instrumentation/
Control Failures

EVENT DATE: 09/15/92 LER #: 92-015-01 REPORT DATE: 06/14/93

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 063

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: John Boccio, Instrumentation and TELEPHONE: (914) 736-8704
Controls Senior Planner

COMPONENT FAILURE DESCRIPTION:

CAUSE: X SYSTEM: JC COMPONENT: LC MANUFACTURER: F180
X JB LC F180

REPORTABLE NPRDS: Y
Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 15, 1992, the reactor automatically tripped from 63% power on "Steam Generator #34 mismatch," an anticipatory low steam generator level reactor trip. The trip was caused by two independent instrumentation/control failures on the same steam generator. The root causes were that implementation of corrective action from a prior event had not been completed and the conservative placement of a protection channel in the fail-safe mode as directed by plant procedures. Corrective action includes the establishment of a refurbishment program which will replace or refurbish the steam generator level controllers. A testing laboratory concluded that the failure of the capacitor, used in

the low level bistable, was due to an internal fabrication defect. The plant was returned to service on October 12, 1992.

END OF ABSTRACT

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INVESTIGATION OF THE EVENT

On September 15, 1992, the plant was operating at 63% power. The unit was operating at a reduced power level because #32 Main Boiler Feed Pump had been taken out of service on September 8, 1992, due to high vibrations. At 0230 hours on September 15, 1992, the control room annunciator "Steam Generator #34 low level channel trip" alarmed. Operators performed Alarm Response Procedure ARP-5, Rev. 12 to address the alarm. The operators correctly determined that the source of the alarm was Steam Generator #34 low level bistable LC-447D (Foxboro Model No. 63U) (F180) (JC) (LC). ARP-5, Rev. 12 instructs the operators to perform Off Normal Operating Procedure ONOP-RPC-1, Rev. 10, "Instrument Failures," in the event of a channel failure.

The actions of ONOP-RPC-1 consisted of tripping the following bistables associated with #34 Steam Generator level channel II:

1. Low-low level
2. High level
3. Low level mismatch

At 0325 hours the reactor automatically tripped on "Steam Generator #34 mismatch." Low-low steam generator water levels following the trip initiated an auto-start of the three auxiliary feedwater pumps. All systems functioned properly following the trip.

The NRC Operations Center was notified via the Emergency Notification System at 0425 hours. The NRC resident inspector was notified at 0428 hours.

The steam generator mismatch trip is an anticipatory low steam generator level reactor trip. The trip logic consists of a single low level bistable paired with a differential bistable that compares steam generator feed flow and steam flow. The logic initiates when steam generator level is less than 8% and steam flow exceeds feed flow by 1.3E6 pounds per hour. Two trains of this logic exist for each steam generator; actuation of either logic train initiates a reactor trip.

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At approximately 0730 hours Instrumentation and Controls (I&C) and Technical Services engineers, using plant computer data, determined that at 0325 hours the output of the level control system for #34 Steam Generator failed low, signaling the #34 Steam Generator feedwater regulating valve closed. Because the low level mismatch bistable had been tripped earlier, when feed flow decreased below steam flow by 1.3E6 pounds per hour, the "Steam Generator #34 mismatch" trip logic was completed, initiating a reactor trip.

Subsequent investigation by I&C Department personnel determined that bistable LC-447D had failed due to an internal fault, an electrolytic capacitor had shorted. LC-447D was repaired, retested, and returned to service. The failed capacitor was sent to a failure analysis laboratory to determine the cause of the failure. Laboratory results concluded that the capacitor failure was due to an internal fabrication defect.

I&C Department personnel, using continuous, on-line computer monitoring, also determined that level controller LC-447M (Foxboro Model No. 62HB-5B) (F180) (JB) (LC) that inputs into the three element controller (FC-447) for #34 Steam Generator's feed regulating valve was spiking low and was the cause of the valve closure. Both controllers were replaced. Steam Generator #34's level control system subsequently retested satisfactorily.

The two failures were independent, occurred fifty-five minutes apart, and each was caused by an individual component failure. No common mode mechanism could be found. The two failed controllers are powered from separate instrument buses and each is in a different instrument channel:

LC-447D LC-447M

Instrument Bus 31 33

Instrument Bus 31 3

A #34 Steam Generator feed regulating valve perturbation event occurred on March 2, 1991. Repair and re-testing was accomplished. A follow-up action item of performing the steam generator level control system periodic preventive refurbishment had not yet been completed.

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An event had occurred on August 30, 1992, in which #34 Steam Generator's feed regulating valve momentarily closed and reopened. I&C Department personnel had investigated by monitoring the controller output on the

plant computer. The instrument air supply to the had been checked. Nothing conclusive was found.

CAUSES OF THE EVENT

The cause of the event was a failure of a steam generator water level controller combined with the procedurally directed action of trip all the bistables in the channel with the failed bistable. The untimely response to previous transients was a contributing factor. Details of the causes are discussed below:

1. The cause of the #34 Steam Generator low level bistable failure was an internal fault, an electrolytic capacitor had shorted. The bistable had been refurbished in 1990. A subsequent analysis confirmed that the cause of failure was from an internal fabrication defect.
2. The cause of the #34 Steam Generator level controller failure was the random internal failure of a relay contact. The root cause of the failure is unknown.
3. A contributing cause to the event was the Indian Point 3 policy of conservatively positioning all channel bistables in a fail safe mode for a failure of a single bistable in the affected channel. The policy will continue to be practiced.
4. A contributing cause was the lower priority scheduling of controller refurbishment. Controller refurbishment was scheduled for the cycle 9/10 outage in the first quarter of 1994.

CORRECTIVE ACTIONS

To prevent recurrence of this event the following corrective actions will be taken:

1. The failed electrolytic capacitor from LC-447D was sent to a failure analysis laboratory to determine the root cause of the failure.

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2. The electrolytic capacitor failure analysis results concluded that the failure was due to an internal fabrication defect. Because the capacitor is used in the Foxboro bistable relay driver, the I&C department provided the Foxboro company a summary of the failure report on May 28, 1993.

3. The I&C department has instituted a preventive refurbishment program which will assure that all of the steam generator level controllers in use will be replaced or refurbished by June 1, 1994. This refurbishment program will also assure, by June 1, 1994, that level controllers in stores are ready for service.

ANALYSIS OF THE EVENT

This event is reportable under 10CFR50.73 (a) (2) (iv), any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS). The Reactor Protection System actuated during this event.

SAFETY SIGNIFICANCE

The loss of feedwater to one steam generator is an event analyzed in the Final Safety Analysis Report. The plant's design provides an auxiliary feedwater system to remove decay heat on a loss of main feedwater. No impact to the public health and safety resulted from this event.

No similar LERs have been reported to date.

SECURING FROM THE EVENT

Following the event, the plant management decided to maintain the plant at shutdown to work on control room work requests since an outage was already planned for September 18, 1992, to address vibration problems in the main electrical generator and #32 Main Boiler Feed Pump. The cold shutdown condition was reached at 0630 hours on September 16, 1992.

On October 11, 1992, plant operators brought the reactor critical at 2255 hours. They synchro
ized the generator to the bus on October 12, 1992,
at
1022 hours and began a load ascension.

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